Academic Specialties in U.S. Are Shifting; Hiring of Women Geoscientists Is Stagnating

Mary Anne Holmes  
*University of Nebraska-Lincoln, mholmes2@unl.edu*

Suzanne O'Connell  
*Wesleyan University, soconnell@wesleyan.edu*

Connie Frey  
*Southern Illinois University Edwardsville, cfrey@siue.edu*

Lois K. Ongley  
*Unity College, longley@unity.edu*

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Women have been receiving a greater proportion of the bachelor’s and master’s degrees in the geosciences over the last 10 years, reaching near 40% in 2000 (latest data available), while receiving only 28% of the Ph.D.s that year. Women are now only 20% of assistant professors at Ph.D.-granting institutions, a proportion that has not changed in the last four years. As part of a larger study to find what key barriers continue to prevent larger numbers of women geoscientists from becoming academics, data have been compiled from the National Science Board [NSB, 2002], and the American Geological Institute’s (AGI) Directory of Geoscience Departments [Claudy, 2001] on geoscience specialty by gender.

The data are broken down by the specialty of the Ph.D., and compared to hiring rates at Ph.D.-granting institutions over the last 10 years. These institutions are the focus because they are the source of future Ph.D.s, and diversity of their faculty is critical to assuring diversity and consequent intellectual vigor and strength of our future academic workforce. The data reveal both a slight shift in the subdisciplines of all geoscientists
employed in tenure-track positions at Ph.D.-granting institutions, and that hiring of women into tenure-track positions in specific subdisciplines has not kept pace with their Ph.D. production during that time.

Data from the NSB are compiled on their Web site (http://srsstats.sbe.nsf.gov) which provides total numbers of male and female recipients by each specialty. Data from the AGI Directory were provided in electronic format that included the name of the individual, the year of the Ph.D., and geoscience specialty, as self-reported, to the individual’s department. Geosciences departments supply an individual’s data to AGI. Gender identity was provided by AGI for about three-fourths of the entries. The Gender of over 3,000 “unknowns” was determined by 1) gender-specific first names; and 2) for gender non-specific first names, we asked colleagues and searched the Internet for photos or gender-identifying text. Seventy-seven persons at Ph.D.-granting institutions remain “unknown.” Seventy-eight entries in Ph.D.-granting institutions had no graduation year and were excluded from the analyses. Of these, ten are listed as assistant professors and 21 as associate professors. Of 652 persons hired into assistant professor positions at Ph.D.-granting institutions listed in the Directory over the last 10 years, 54 (52 males, 1 female, 1 unknown gender) received the Ph.D. from some institution outside of the U.S. (including six unspecified institutions). The subdisciplines with the greatest proportion of non-U.S. Ph.D.s include geochemistry, which had 10 males out of 59 from non-U.S. institutions hired as assistant professors; geophysics, which had 12 of 68; and oceanography, which had 11 males out of 58 total hired. All persons listed in the Directory were reported regardless of where the Ph.D. was obtained, because these are the positions at Ph.D.-granting institutions that were open and had persons hired into them in the U.S. over the last 10 years.

All specialties in the Directory were grouped together to determine the proportion of gender for each specialty. The two data bases, NSB’s and the Directory, differ slightly in how the specialties are classified, but some cross-comparisons are possible. Statistical differences reported here are based on X² tests for independence and for associations.

20% of Recent Ph.D.s now in AGI Directory; Fewer than 10% in Tenure-track Positions

Over the period 1992-2001, 8,877 Ph.D.s were awarded in the geosciences (Table 1; NSB, 2002). Twenty percent (1,925) of these Ph.D. recipients are now listed in the 2001 Directory as employed by academia, state surveys, museums, and research institutions (Table 2). Six hundred fifty-two (7%) of these Ph.D.s were hired into tenure-track positions (assistant professors) at Ph.D-granting institutions (Table 3); there is some error in the percentages, because 921 of the geoscience Ph.D.s were in soil science. While the Directory includes only 20 soil science/agronomy departments, thus underreporting soil scientists working at Ph.D.-granting institutions, Excluding soil science, 598 of the 7,966 Ph.D.s produced—or 7.5% were hired into tenure-track positions at Ph.D-granting institutions (Table 3).

Some institutions hired a greater proportion of women than the proportion of women who received a Ph.D. These include non-degree-granting academic programs, museums, non-tenure-track positions at master’s and bachelors-granting institutions, and tenure-track positions at bachelors degree-granting institutions (Table 2).
Conversely, lower-than-average hiring of women Ph.D.s occurred at AA-granting institutions, research centers, state surveys, Ph.D.-granting institutions (tenure-and non-tenure-track), and tenure-track positions at master’s-granting institutions (Table 2). State surveys hired the lowest proportion of women: only 8% of hires in the last 10 years were female. The people hired into tenure-track positions at doctoral-granting institutions will be producing the new Ph.D.s in the coming decades. One hundred thirty-six women—6.3% of all female Ph.D.s earned between 1992 and 2001—were hired into tenure-track positions at Ph.D.-granting institutions, while 508 (7.6% of male Ph.D.s) men were hired. These proportions are not significantly different (based on a $X^2$ test).

### Numbers of Women Ph.D.s; Where They’ve Been Hired

<table>
<thead>
<tr>
<th>Specialty</th>
<th>Female</th>
<th>Male</th>
<th>Unknown</th>
<th>% Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geology</td>
<td>21</td>
<td>52</td>
<td>3</td>
<td>27.6%</td>
</tr>
<tr>
<td>Oceanography</td>
<td>120</td>
<td>473</td>
<td>7</td>
<td>20.0%</td>
</tr>
</tbody>
</table>

Specialty Drift and Hiring Stagnation

Of those geoscientists listed in the AGI Directory, which includes geoscientists with Ph.D.s earned as long ago as 1946, most geoscientists list themselves as ‘geology’ specialists, followed by oceanography, geophysics, geochemistry, and soil science (Figure 1). For academics hired only in the last 10 years, the dominant specialty remains geology, followed by geochemistry, geophysics, oceanography, and hydrology (Figure 2). The proportions of paleontologists, soil scientists, and atmospheric/metereologists in tenure-track positions at Ph.D-granting institutions listed in the Directory have declined over the last 10 years.

Specialties of Recent Ph.D.s

Geoscience specialty is significantly different between men and women (based on a $X^2$ test for association, $p = 0.000$). The geoscience specialty most sought after by women is oceanography/marine sciences and geology (375, or 17% of women’s Ph.D.s are in each field; see Table 1). Rounding out the top five subdiscipline choices for women are the
Hiring of Women Geoscientists Is Stagnating

Hiring into Ph.D. Tenure-track Does Not Match Ph.D. Production

Hiring of the subdisciplines by Ph.D-granting institutions did not match Ph.D. production during 1992-2001. The discrepancy between production and hiring is somewhat greater for males than for females: X² = 210.5 for males; 116.5 for females; p = 0.000 for each value). Most women were hired into geochemistry positions (30), followed by oceanography (21), soil science (16), paleontology (15), and geophysics (12; see Table 3). Most men were hired into geophysics positions (65), followed by geochemistry (59), oceanography (52), hydrology (46), atmospheric/meteorology (43), and geology (42).

Most women academics are paleontologists, followed by geochemists, oceanographers, geologists, and hydrologists (Figure 1). In the last 10 years, the fields in which women have fared better than average (i.e., hired into assistant professor positions at rates equal to or greater than the average production of female Ph.D.s) are paleontology, geochemistry, soil science, oceanography, and economic geology (Figure 2).

Hiring rates for women in geomorphology/glacial geology has significantly underperformed Ph.D. production (X² = 3.749; p = 0.053). Women earned 43 (28%) of the Ph.D.s in geomorphology, but only two women, or 9%, of the new geomorphology positions, were hired by a Ph.D-granting institution. For all other specialties, there was no significant difference between male and female Ph.D. production and hiring into assistant professor positions at Ph.D-granting institutions.

Future Studies

A series of focus groups of geoscientists at different academic ranks are now being completed to determine whether the experiences and perceptions of women geoscientists differ from men as they ascend the ranks of academia. Based on an initial preview of the data, there is a greater difference in perception between generations than in perception between genders. There is little difference in attitudes by race or ethnicity, but low numbers of racial and ethnic minorities in our field preclude us from making firm generalizations.

Older geoscientists, both male and female, expressed frustration with the slow pace of women’s advancement through the ranks of academia. Younger geoscientists are split between a discomfort with the data and an optimistic view that their science has become more diverse (at least in terms of gender). They believe that this trend will continue without the need for any type of intervention or alteration in the way academia is conducted. Older geoscientists do believe intervention will be necessary to advance gender equity.

Data from NSF on proportions of women receiving a bachelor’s, master’s, and Ph.D.s do indicate increases over the last 10 years; but we see stagnation in the hiring of female assistant professors, particularly at Ph.D-granting institutions, in the last four years [Holmes et al., 2002a and b]. Although the causes are complex, we believe that there are, among the more intransigent barriers, some simple structural barriers that geoscience departments can easily overturn if they are interested in increasing the gender diversity of their faculty. These include 1) raising awareness that there is a problem with lack of diversity in the geosciences, understanding that this affects the intellectual vigor and strength of our field, and beginning to earnestly work toward a more diverse faculty (without a will, there will be no way): 2) assuring that teaching climates are amenable and fair: Are female students being called on at the same rate as males? Are they allowed to give complete comments/questions without interruption from other students and faculty? Are female students’ ideas given credece and credit? And, 3) assuring that female graduate students are included in the network of colleagues who can help them find postdoctorate positions and academic jobs. We need to begin thinking seriously about how to accommodate the overlap of the tenure and biological clocks as elucidated in de Wet et al. [2002].

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References


